

1           **What Is Claimed Is:**

2           1. A method of processing a packet in a gateway device, said method comprising:  
3           providing a search utility in said gateway, said search utility enabling the retrieval of  
4           both a routing information and a network address translation (NAT) information necessary  
5           for processing said packet in a single search operation, wherein said NAT information  
6           specifies a new address for an original address in said packet;  
7           receiving said packet containing said original address;  
8           determining said routing information and said NAT information for said packet in a  
9           single search operation by using said search utility;  
10           substituting said new address for said original address in said packet; and  
11           forwarding said packet with said new address according to said forwarding  
information.

1           2. The method of claim 1, wherein said providing comprises maintaining a single table  
2           for both said routing information and said NAT information.

1           3. The method of claim 2, wherein said maintaining comprises storing said single  
2           table in a content addressable memory (CAM) indexed by a source address and a destination  
3           address, wherein said determining comprises providing the source address and destination  
4           address in said packet as a key to said CAM to retrieve said routing information and said NAT  
5           information.

1           4. The method of claim 3, wherein said CAM comprises a multi-way CAM.

1           5. The method of claim 1, wherein said gateway device comprises a service selection  
2           gateway (SSG) connecting a plurality of remote systems to a plurality of service domains,  
3           wherein one of said original address and said new address comprises a local address of a  
4           remote system and the other address comprises an external address in a service domain for

5 said remote system, said maintaining further comprises:  
6       storing NAT information and forwarding information in a plurality of tables partitioned  
7   according to service domains such that forwarding information and NAT information related  
8   to the same service domain is stored in the same one of said plurality of tables.

1       6. The method of claim 5, wherein at least one of said plurality of tables stores NAT  
2   information and forwarding information related to at least two of said plurality of service  
3   domains, wherein the address spaces accessible in said at least two of said plurality of service  
4   domains do not overlap.

1       7. The method of claim 1, wherein said forwarding information comprises an interface  
on said gateway device, wherein said forwarding comprises sending said packet on said  
interface, wherein said packet is received in the form of an Internet Protocol (IP) packet.

8. A gateway device for processing a packet, said gateway device comprising:  
means for searching enabling the retrieval of both a routing information and a network  
address translation (NAT) information necessary for processing said packet in a single search  
operation, wherein said NAT information specifies a new address for an original address in  
5 said packet;

6       means for receiving said packet containing said original address;  
7       means for determining said routing information and said NAT information for said  
8   packet by using said single search;  
9       means for substituting said new address for said original address in said packet; and  
10      means for forwarding said packet with said new address according to said forwarding  
11   information.

1       9. The gateway device of claim 8, wherein said means for searching maintains a single  
2   table for both said routing information and said NAT information.

1           10. The gateway device of claim 8, wherein said memory means stores said single  
2 table in a content addressable memory (CAM) indexed by a source address and a destination  
3 address, wherein said means for determining comprises means for providing the source  
4 address and destination address in said packet as a key to said CAM to retrieve said routing  
5 information and said NAT information.

1           11. The gateway device of claim 10, wherein said CAM comprises a multi-way CAM,  
2 said packet comprises an IP packet, and said forwarding information comprises an interface  
3 on said gateway device, wherein said means for forwarding sends said packet on said  
4 interface.

1           12. The gateway device of claim 8, wherein said gateway device comprises a service  
2 selection gateway (SSG) connecting a plurality of remote systems to a plurality of service  
3 domains, wherein one of said original address and said new address comprises a local address  
4 of a remote system and the other address comprises an external address in a service domain  
5 for said remote system, said memory means stores NAT information and forwarding  
6 information in a plurality of tables partitioned according to service domains such that  
7 forwarding information and NAT information related to the same service domain is stored in  
8 the same one of said plurality of tables.

1           13. The gateway device of claim 12, wherein at least one of said plurality of tables  
2 stores NAT information and forwarding information related to at least two of said plurality  
3 of service domains, wherein the address spaces accessible in said at least two of said plurality  
4 of service domains do not overlap.

1           14. A computer readable medium carrying one or more sequences of instructions for  
2 causing a gateway device to process a packet, wherein execution of said one or more

3 sequences of instructions by one or more processors contained in said gateway device causes  
4 said one or more processors to perform the actions of:

5 providing a search utility in said gateway, said search utility enabling the retrieval of  
6 both a routing information and a network address translation (NAT) information necessary  
7 for processing said packet in a single search operation, wherein said NAT information  
8 specifies a new address for an original address in said packet;

9 receiving said packet containing said original address;

10 determining said routing information and said NAT information for said packet in a  
11 single search operation by using said search utility;

12 substituting said new address for said original address in said packet; and

13 forwarding said packet with said new address according to said forwarding  
14 information.

15. The computer readable medium of claim 14, wherein said providing comprises  
maintaining a single table for both said routing information and said NAT information.

16. The computer readable medium of claim 15, wherein said maintaining comprises  
storing said single table in a content addressable memory (CAM) indexed by a source address  
3 and a destination address, wherein said determining comprises providing the source address  
4 and destination address in said packet as a key to said CAM to retrieve said routing  
5 information and said NAT information.

17. The computer readable medium of claim 16, wherein said CAM comprises a  
2 multi-way CAM and said packet is received in the form of an IP packet.

18. The computer readable medium of claim 14, wherein said gateway device  
2 comprises a service selection gateway (SSG) connecting a plurality of remote systems to a  
3 plurality of service domains, wherein one of said original address and said new address

4       comprises a local address of a remote system and the other address comprises an external  
5       address in a service domain for said remote system, said maintaining further comprises:  
6            storing NAT information and forwarding information in a plurality of tables partitioned  
7        according to service domains such that forwarding information and NAT information related  
8        to the same service domain is stored in the same one of said plurality of tables.

1           19. The computer readable medium of claim 18, wherein at least one of said plurality  
2        of tables stores NAT information and forwarding information related to at least two of said  
3        plurality of service domains, wherein the address spaces accessible in said at least two of said  
4        plurality of service domains do not overlap.

1           20. A gateway device for processing a packet, said gateway device comprising:  
2            a memory unit storing a routing information and a network address translation (NAT)  
3        information necessary for processing said packet, wherein said NAT information specifies a  
4        new address for an original address in said packet;  
5            an inbound interface receiving said packet containing said original address;  
6            a forwarding and NAT block determining said routing information and said NAT  
7        information for said packet using a single search, said forwarding and NAT block substituting  
8        said new address for said original address in said packet; and  
9            an outbound interface forwarding said packet with said new address according to said  
10      forwarding information.

1           21. The gateway device of claim 20, wherein said memory unit stores said routing  
2        information and said NAT information in a single table.

1           22. The gateway device of claim 21, wherein said memory unit comprises a content  
2        addressable memory (CAM) indexed by a source address and a destination address, wherein  
3        said forwarding and NAT block sends the source address and destination address in said

4 packet as a key to said CAM to retrieve said routing information and said NAT information.

1 23. The gateway device of claim 22, wherein said CAM comprises a multi-way CAM  
2 and said packet comprises an IP packet.

1 24. The gateway device of claim 20, wherein said gateway device comprises a service  
2 selection gateway (SSG) connecting a plurality of remote systems to a plurality of service  
3 domains, wherein one of said original address and said new address comprises a local address  
4 of a remote system and the other address comprises an external address in a service domain  
5 for said remote system, wherein said memory unit stores NAT information and forwarding  
6 information in a plurality of tables partitioned according to service domains such that  
forwarding information and NAT information related to the same service domain is stored in  
the same one of said plurality of tables.

25. The gateway device of claim 24, wherein at least one of said plurality of tables  
stores NAT information and forwarding information related to at least two of said plurality  
of service domains, wherein the address spaces accessible in said at least two of said plurality  
of service domains do not overlap.

1 26. The gateway device of claim 25, further comprising a service selection block  
2 determining a specific service to which said packet relates to and causes said packet to be  
3 processed according to a corresponding one of said plurality of tables.

1 27. The gateway device of claim 26, further comprising a plurality of forwarding and  
2 NAT blocks wherein each of said plurality of forwarding and NAT blocks is coupled to a  
3 corresponding one of said memory units, wherein each memory unit stores one of said  
4 plurality of tables.